NASA SP-7037 (310)
November 1994

AERONAUTICAL ENGINEERING

A CONTINUING BIBLIOGRAPHY WITH INDEXES

(NASA-SP-7037(310)) AERONAUTICAL ENGINEERING: A CONTINUING BIBLIOGRAPHY WITH INDEXES (SUPPLEMENT 310) (NASA) 29 p

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NASA SP-7037 (310)
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AERONAUTICAL ENGINEERING

A CONTINUING BIBLIOGRAPHY WITH INDEXES

National Aeronautics and Space Administration
Scientific and Technical Information Program
Washington, DC 1994

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INTRODUCTION

This issue of *Aeronautical Engineering — A Continuing Bibliography with Indexes* (NASA SP-7037) lists 29 reports, journal articles, and other documents recently announced in the NASA STI Database.

Accession numbers cited in this issue include:

Scientific and Technical Aerospace Reports (STAR) (N-10000 Series)	N94-37481 — N94-37856
Open Literature (A-60000 Series)	A94-61886 — A94-62340

The coverage includes documents on the engineering and theoretical aspects of design, construction, evaluation, testing, operation, and performance of aircraft (including aircraft engines) and associated components, equipment, and systems. It also includes research and development in aerodynamics, aeronautics, and ground support equipment for aeronautical vehicles.

Each entry in the publication consists of a standard bibliographic citation accompanied in most cases by an abstract. The listing of the entries is arranged by the first nine *STAR* specific categories and the remaining *STAR* major categories. This arrangement offers the user the most advantageous breakdown for individual objectives. The citations include the original accession numbers from the respective announcement journals.

Seven indexes—subject, personal author, corporate source, foreign technology, contract number, report number, and accession number—are included.

A cumulative index for 1994 will be published in early 1995.

Information on availability of documents listed, addresses of organizations, and CASI price schedules are located at the back of this issue.

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Category 10 Astronautics N.A.
Includes astronautics (general); astrodynamics; ground support systems and facilities (space); launch vehicles and space vehicles; space transportation; space communications, spacecraft communications, command and tracking; spacecraft design, testing and performance; spacecraft instrumentation; and spacecraft propulsion and power.

Category 11 Chemistry and Materials N.A.
Includes chemistry and materials (general); composite materials; inorganic and physical chemistry; metallic materials; nonmetallic materials; propellants and fuels; and materials processing.

Category 12 Engineering 604
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Category 16 Physics 606
Includes physics (general); acoustics; atomic and molecular physics; nuclear and high-energy; optics; plasma physics; solid-state physics; and thermodynamics and statistical physics.

Category 17 Social Sciences N.A.
Includes social sciences (general); administration and management; documentation and information science; economics and cost anaylsis; law, political science, and space policy; and urban technology and transportation.

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TYPICAL REPORT CITATION AND ABSTRACT

NASA SPONSORED
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ACCESSION NUMBER → N94-10675*# National Aeronautics and Space Administration. ← CORPORATE SOURCE
Langley Research Center, Hampton, VA.

TITLE → **STATIC INTERNAL PERFORMANCE OF A SINGLE EXPANSION RAMP NOZZLE WITH MULTIAXIS THRUST VECTORING CAPABILITY**

AUTHORS → FRANCIS J. CAPONE and ALBERTO W. SCHIRMER (George Washington Univ., Hampton, VA.) Washington Jul. 1993 ← PUBLICATION DATE
272 p

CONTRACT NUMBER → (Contract RTOP 505-62-30-01)

REPORT NUMBERS → (NASA-TM-4450; L-17163; NAS 1.15:4450) Avail: CASI HC A12/ ← AVAILABILITY AND PRICE CODE
MF A03

An investigation was conducted at static conditions in order to determine the internal performance characteristics of a multiaxis thrust vectoring single expansion ramp nozzle. Yaw vectoring was achieved by deflecting yaw flaps in the nozzle sidewall into the nozzle exhaust flow. In order to eliminate any physical interference between the variable angle yaw flap deflected into the exhaust flow and the nozzle upper ramp and lower flap which were deflected *for pitch vectoring, the downstream corners of both the nozzle* ramp and lower flap were cut off to allow for up to 30 deg of yaw vectoring. The effects of nozzle upper ramp and lower flap cutout, yaw flap hinge line location and hinge inclination angle, sidewall containment, geometric pitch vector angle, and geometric yaw vector angle were studied. This investigation was conducted in the static-test facility of the Langley 16-foot Transonic Tunnel at *nozzle pressure ratios up to 8.0.* Author (revised)

TYPICAL JOURNAL ARTICLE CITATION AND ABSTRACT

NASA SPONSORED

ACCESSION NUMBER → A94-60042* National Aeronautics and Space Administration. ← CORPORATE SOURCE
Lewis Research Center, Cleveland, OH.

TITLE → **EXPERIMENTAL INVESTIGATION OF COUNTER-ROTATING PROPFAN FLUTTER AT CRUISE CONDITIONS**

AUTHORS → ORAL MEHMED NASA Lewis Research Center, Cleveland, OH and ← AUTHOR'S AFFILIATION
ANATOLE P. KURKOV *Journal of Propulsion and Power* (ISSN ← JOURNAL TITLE

PUBLICATION DATE → 0748-4658) vol. 10, no. 3 May-June 1994 p. 343-347 refs

REPORT NUMBER → (BTN-94-EIX94321333310) Copyright

This article presents wind-tunnel experimental flutter results, at transonic relative flows, for a 0.62-m-diam composite propfan model. A blade row that fluttered was tested alone, and with a stable aft counter-rotating blade row. The major objectives of the experiment were to study the effect of the second blade row on the row in flutter, and to investigate the flutter. Results show that the second row had a small stabilizing effect. Two distinct flutter modes were found within the operating regime of the rotor: both apparently single-degree-of-freedom instabilities, associated respectively with the first and second natural blade modes. For both flutter modes, flutter boundary, frequency, nodal diameter, and blade displacement data are given. The blade displacement data, obtained with an optical method, gives an indication of the flutter mode shape at a span near the blade tip. Author (EI)

AERONAUTICAL ENGINEERING

A Continuing Bibliography (Suppl. 310)

November 1994

02
AERODYNAMICS

Includes aerodynamics of bodies, combinations, wings, rotors, and control surfaces; and internal flow in ducts and turbomachinery.

A94-62276
ANALYSIS OF ROTOR BLADE DYNAMICS USING MODEL SCALE UH-60A AIRLOADS
MICHAEL TOROK Sikorsky Aircraft, Stratford, CT, US and ROBERT K. GOODMAN Sikorsky Aircraft, Stratford, CT, US *Journal of the American Helicopter Society* (ISSN 0002-8711) vol. 39, no. 1 January 1994 p. 63-69
(HTN-94-00300) Copyright

A structural dynamics model of a modern articulated helicopter rotor is evaluated by applying measured airloads as a forcing function to the structural mode. Measured airloads and blade bending moments are obtained from a model scale UH-60A BLACKHAWK rotor. Test conditions selected for this study include cases in which blade modal frequencies are close to rotor harmonics. Though such conditions are a severe test for a dynamic analysis, the structural model performs favorably. Detailed documentation and refined discretization of blade structural properties leads to good agreement between non-rotating blade modal frequencies and rap test data. Accurate predictions of blade modal characteristics at design RPM values leads to excellent agreement between predicted and measured flatwise bending moments. Good edgewise bending predictions prove sensitive to coupling between the rotor system and fixed system, coupling of blade modes, and the non-linear characteristics of the lag damper. Torsional bending moment predictions are only fair, with disagreement possibly due to inadequate modeling of the rotor control system. The generally high quality of agreement between calculated and measured blade response, and the excellent agreement between calculated blade modal frequencies and rap-test data, yields confidence in the quality of both the experiment data and the dynamic model. Author (Herner)

N94-37505*# National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.
SUBSONIC AERODYNAMIC CHARACTERISTIC OF SEMISPAN COMMERCIAL TRANSPORT MODEL WITH WING-MOUNTED ADVANCED DUCTED PROPELLER OPERATING IN REVERSE THRUST
ZACHARY T. APPLIN, KENNETH M. JONES, BRENDA E. GILE, and P. FRANK QUINTO Jul. 1994 114 p
(Contract RTOP 535-03-10-02)
(NASA-TP-3427; L-1782; NAS 1.60:3427) Avail: CASI HC A06/MF A02

A test was conducted in the Langley 14 by 22 Foot Subsonic Tunnel to determine the effect of the reverse-thrust flow field of a wing-mounted advanced ducted propeller on the aerodynamic characteristics of a semispan subsonic high-lift transport model. The advanced ducted propeller (ADP) model was mounted separately in position alongside the wing so that only the aerodynamic interference of the propeller and nacelle affected the aerodynamic performance of the transport model. Mach numbers ranged from 0.14 to 0.26; corresponding Reynolds numbers ranged from 2.2 to 3.9 x 10(exp 6). The reverse-thrust flow field of the ADP shielded a portion of the wing from the free-stream airflow and reduced both lift and drag. The reduction in lift and drag was a function of ADP rotational speed and free-stream velocity. Test results included ground effects data for the transport model and ADP configuration. The ground plane caused a beneficial increase in drag and an undesirable slight increase in lift. The ADP and transport model performance in ground effect was similar to performance trends observed for out of ground effect. The test results form a comprehensive data set that supports the application of the ADP engine and airplane concept on the next generation of advanced subsonic transports. Before this investigation, the engine application was predicted to have detrimental ground effect characteristics. Ground effect test measurements indicated no critical problems and were the first step in proving the viability of this engine and airplane configuration. Author (revised)

N94-37511*# Tennessee Univ. Space Inst., Tullahoma, TN.
SUPERSONIC LAMINAR FLOW CONTROL RESEARCH Semiannual Report No. 1, Jan. - Jun. 1994
C. F. LO 1994 5 p
(Contract NAG2-881)
(NASA-CR-196260; NAS 1.26:196260) Avail: CASI HC A01/MF A01

The objective of the research is to understand supersonic laminar flow stability, transition and active control. Some prediction techniques will be developed or modified to analyze laminar stability. The effects of supersonic laminar flow with distributed heating and cooling on active control will be studied. The primary tasks of the research applying to the NASA/Ames POC and LFSWT's nozzle design with laminar flow control are as follows: (1) supersonic laminar boundary layer stability and transition prediction; (2) effects of heating and cooling for supersonic laminar flow control; and (3) POC and LFSWT nozzle design with heating and cooling effects combining wall contour and length changes. Author

N94-37604# Starmark Corp., Arlington, VA.
COMPOSITE HELICOPTER ACCIDENT PROFILES: DEFICIENT CREW/AIRCRAFT PERFORMANCE
DAVID L. GREEN Jul. 1994 115 p Prepared for Systems Control Technology, Inc., Arlington, VA
(Contract DTFA01-87-C-00014)
(SCT-90RR-46; DOT/FAA/RD-94/22) Avail: CASI HC A06/MF A02

The purpose of this report is twofold. First, the unique characteristics of a wide variety of helicopter operations which ended in a collision with terrain features or man-made obstructions were analyzed. Special emphasis was given to operations during difficult visual conditions. Second, this report provides the reader with systematic insights into the affiliated technical and operational aspects of helicopter flight operations which contributed to this category of accident. The report explores the way helicopters are flown in the low airspace and employs composite accident summaries as points of departure to both illustrate and substantiate the analysis which in turn identifies opportunities for improved flight safety and productivity in the National Airspace System (NAS). The

included analysis deals with a series of rotorcraft accidents involving terrain and obstruction strikes. The common characteristics of these accidents support the need for specific changes. Each composite accident is illustrated and treated to an analysis which often allows the reader to focus on one characteristic in isolation. The summaries of these composite accidents and supporting analysis are included in the report to provide a common information base for the FAA analysts and industry engineers to support the need for additional equipment, new procedures, new products, additional training, and regulatory change. This technical report contains pertinent data and testing/guidance material needed to support those elements of the agency charged with performance of regulatory actions and the development of advisory materials and standards. Author

N94-37706# Boeing Commercial Airplane Co., Seattle, WA. Technology and Product Development - Payloads.
AIRCRAFT COMMAND IN EMERGENCY SITUATIONS PROTOTYPE DEVELOPMENT USERS MANUAL Final Report
GREGORY E. GRIMSTAD Jun. 1994 77 p Original contains color illustrations
(Contract DTFA03-89-C-00061)
(DOT/FAA/CT-94/24) Avail: CASI HC A05/MF A01

This project involved assembly of the hardware and development of the software identified in ACES Phase 1 Concept Development contract study. The assembled system allows three critical stages in responding to an aircraft inflight smoke/fire event to be examined. These stages are (1) sensing (data gathering), (2) establishing the alerting criteria to maintain quick response while reducing false alarms (data analysis), and (3) methods of providing assistance to the crew, both flight deck and cabin, in responding to an inflight event. Four smoke/particle sensors are linked to a computer via a high speed data acquisition and control system. On the computer reside alerting logic functions and the capability to emulate the flight deck and cabin attendant displays. In addition, a thermal system that allows both location and temperature of numerous zones on a single fiber optic cable to be known was identified as a means to reduce false alarms and monitor hidden areas of an aircraft. The primary objective of the ACES system concept is to provide the capability to reduce the time required for the flight crew to make a decision to land the aircraft during an inflight smoke/fire event. Author (revised)

N94-37767 Department of the Navy, Washington, DC.
CANOPY BREAKING DEVICE Patent
FREDERICK C. GUILL, inventor (to Navy) 12 Apr. 1994 7 p Filed 17 Mar. 1993
(AD-D016294; US-PATENT-5,301,904; US-PATENT-APPL-SN-035780; US-PATENT-CLASS-244-129.1) Avail: US Patent and Trademark Office

An aircraft canopy breaking device is described, having means for penetrating the canopy glazing material upon application of an applied force from the rising ejection seat to the penetrating means. The device further comprises prepositioning means for prepositioning the penetrating means at a fixed distance from the canopy glazing material, shielding the penetrating means from inadvertently contacting the canopy glazing material, other material or personnel, and compressing whereby upon application of a force the penetrating means contacts the canopy glazing material causing crack propagation in the canopy glazing material. DTIC

04
AIRCRAFT COMMUNICATIONS AND NAVIGATION

Includes digital and voice communication with aircraft; air navigation systems (satellite and ground based); and air traffic control.

N94-37830# Department of the Navy, Washington, DC.
MARKER BEACON CASE Patent Application
FREDERICK F. HILTZ, inventor (to Navy) and CHARLES E. WILSON, inventor (to Navy) 23 Mar. 1994 79 p
(AD-D016322; US-PATENT-APPL-SN-216559; NAVY-CASE-74641) Avail: CASI HC A05/MF A01

A multifunctional case that is suitable for storing, carrying or launching a marker beacon is presented. The launching could be in a dense jungle to place the marker beacon atop tree branches to make it visible from the air, or the case may be adapted for launching at sea. The case has a triggering mechanism for launching the marker beacon. It has alignment means that comprises a first alignment position for inhibiting a launch when storing or carrying the marker beacon within the case. The alignment means has a second position for placing the marker beacon in position to be launched. The launching takes place upon activation of a triggering mechanism that forms part of the case. DTIC

N94-37839 Department of the Navy, Washington, DC.
SYSTEM FOR BROADCASTING MARKER BEACON SIGNALS AND PROCESSING RESPONSES FROM SEEKING ENTITIES Patent Application
FREDERICK F. HILTZ, inventor (to Navy) and CHARLES E. WILSON, inventor (to Navy) 23 Mar. 1994 84 p Limited *Reproducibility: More than 20% of this document may be affected by* microfiche quality
(AD-D016313; US-PATENT-APPL-SN-216567; NAVY-CASE-74643) Avail: CASI HC A05

The present invention relates to a surface deployed navigational beacon, which is nominally secure from nonfriendly forces. More particularly the beacon is capable of user selection of any of a plurality of codes to modulate a transmitted radio signal. The signal is used by the navigational entity to determine direction to the beacon, as well as to distinguish a particular beacon from others which may be deployed within the same broad area. The beacon has the capability of receiving selected coded radio signals sent from the navigating entity. One received signal results in a signal being sent back to the navigating entity from the beacon for the purpose of providing slant range distance between the beacon and the navigating entity. Another signal received by the beacon from the navigating entity is employed to trigger a flare, integral to the beacon assembly, for backup visual/infrared navigational purposes. DTIC

N94-37636*# National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.
STABILITY ANALYSIS OF AN F/A-18 E/F CABLE MOUNT M ODEL
NANCY THOMPSON and MOSES FARMER Jun. 1994 24 p
(Contract RTOP 505-63-50-13)
(NASA-TM-108989; NAS 1.15:108989) Avail: CASI HC A03/MF A01

A full-span F/A-18 E/F cable mounted wind tunnel model is part of a flutter clearance program at the NASA Langley Transonic Dynamics Tunnel. Parametric analysis of this model using GRUMCBL software was conducted to assess stability for wind tunnel tests. Two configurations of the F/A-18 E/F were examined. The parameters examined were pulley-cable friction, mach number, dynamic pressure, cable geometry, center of gravity location, cable tension, snubbing the model, drag, and test medium. For the nominal cable geometry (Cable Geometry 1), Configuration One was unstable for cases with higher pulley-cable friction coefficients. A new cable geometry (Cable Geometry 3) was determined in which Configuration One was stable for all cases evaluated. Configuration Two with the nominal center of gravity position was found to be unstable for cases with higher pulley-cable friction coefficients; however, the model was stable when the center of gravity moved forward 1/2. The model was tested using the cable mount system during the initial wind tunnel entry and was stable as predicted. Author

N94-37762*# National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

ORDERING DESIGN TASKS BASED ON COUPLING STRENGTHS

JAMES L. ROGERS, JR. and CHRISTINA L. BLOEBAUM Jul. 1994 12 p *Presented at 5th MDO-AIAA/NASA/USAF/ISSMO Conference, Panama City, FL, 7-9 Sep. 1994*

(Contract NSF DDM-93-09706; RTOP 505-63-50-06)
(NASA-TM-109137; NAS 1.15:109137) Avail: CASI HC A03/MF A01

The design process associated with large engineering systems requires an initial decomposition of the complex system into modules of design tasks which are coupled through the transference of output data. In analyzing or optimizing such a coupled system, it is essential to be able to determine which interactions figure prominently enough to significantly affect the accuracy of the system solution. Many decomposition approaches assume the capability is available to determine what design tasks and interactions exist and what order of execution will be imposed during the analysis process. Unfortunately, this is often a complex problem and beyond the capabilities of a human design manager. A new feature for DeMAID (Design Manager's Aid for Intelligent Decomposition) will allow the design manager to use coupling strength information to find a proper sequence for ordering the design tasks. In addition, these coupling strengths aid in deciding if certain tasks or couplings could be removed (or temporarily suspended) from consideration to achieve computational savings without a significant loss of system accuracy. New rules are presented and two small test cases are used to show the effects of using coupling strengths in this manner. Author

06

AIRCRAFT INSTRUMENTATION

Includes cockpit and cabin display devices; and flight instruments.

N94-37658*# Boeing Commercial Airplane Co., Seattle, WA. Flight Deck Research.

SYNTHETIC VISION DISPLAY EVALUATION STUDIES Final Report

DAVID M. REGAL and DAVID H. WHITTINGTON Aug. 1994 67 p

(Contract NAS1-19360; RTOP 537-08-20-01)
(NASA-CR-194963; NAS 1.26:194963) Avail: CASI HC A04/MF A01

The goal of this research was to help us understand the display requirements for a synthetic vision system for the High Speed Civil Transport (HSCT). Four experiments were conducted to examine the effects of different levels of perceptual cue complexity in displays used by pilots in a flare and landing task. Increased levels of texture mapping of terrain and runway produced mixed results, including harder but shorter landings and a lower flare initiation altitude. Under higher workload conditions, increased texture resulted in an improvement in performance. An increase in familiar size cues did not result in improved performance. Only a small difference was found between displays using two patterns of high resolution texture mapping. The effects of increased perceptual cue complexity on performance was not as strong as would be predicted from the pilot's subjective reports or from related literature. A description of the role of a synthetic vision system in the High Speed Civil Transport is provide along with a literature review covering applied research related to perceptual cue usage in aircraft displays. Author

08

AIRCRAFT STABILITY AND CONTROL

Includes aircraft handling qualities; piloting; flight controls; and autopilots.

A94-62274 National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.

CONTROL LAWS FOR A HOVERING HELICOPTER

MARC D. TAKAHASHI NASA Ames Research Center, Moffett Field, CA, US *Journal of the American Helicopter Society* (ISSN 0002-8711) vol. 39, no. 1 January 1994 p. 50-62

(HTN-94-00298) Copyright

The use of rigid-body and rotor-state feedback gains in the design of helicopter flight control laws was investigated analytically on a blade element, articulated rotor, helicopter model. The study was conducted while designing a control law to meet an existing military rotorcraft handling qualities design specification (ADS-33C) in low-speed flight. A systematic approach to meet this specification was developed along with an assessment of the function of these gains in the feedback loops. Using the results of this assessment, the pitch and roll crossover behavior was easily modified by adjusting the body attitude and rotor-flap feedback gains. Critical to understanding the feedback gains is that the roll and pitch rate dynamics each have second-order behavior, not the classic first-order behavior, which arises from a quasi-static rotor, six degree-of-freedom model. Author (Herner)

A94-62277

VARIATION IN HOVER AEROMECHANICAL STABILITY TRENDS WITH BEARINGLESS MAIN ROTOR DESIGN

WILLIAM H. WELLER United Technologies Research Center, East Hartford, CT, US *Journal of the American Helicopter Society* (ISSN 0002-8711) vol. 39, no. 1 January 1994 p. 70-80

(HTN-94-00304) Copyright

An experimental program has been conducted to measure the aeromechanical stability characteristics of a Beringless Main Rotor (BMR) model. The model is based on a four bladed concept with a flexure, between the hub and each blade, which accommodates flatwise, edgewise, and torsional (pitch) motions. The flexure is enclosed by a torsionally stiff cuff that is cantilevered to the blade/flexure joint at its outboard end and shear restrained to the flexure at its inboard end. The shear restraint includes an elastomeric damper to stabilize edgewise motion. The model was tested in hover over a range of rotor thrust and rotational speed. Numerous rotor hub design parameters were varied to determine their effect on aeromechanical stability characteristics of the model. These included changes in fundamental flatwise natural frequency, blade built-in cone and sweep angles, pitch link inclination, flexure prepitch, shear restraint to flexure attachment, movement of the pitch link attachment from the trailing edge to a leading edge location, or various combinations. The results in this paper show that most design changes, which were employed to increase aeromechanical stability margins, provided only negligible improvements or were detrimental in their effects. Movement of the pitch link attachment to the leading edge does provide improved stability characteristics at the higher collective pitch angles, which are usually critical, although the stability margins for this configuration were still small.
Author (Herner)

09
RESEARCH AND SUPPORT FACILITIES (AIR)

Includes airports, hangars and runways; aircraft repair and overhaul facilities; wind tunnels; shock tube facilities; and engine test blocks.

N94-37522*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.
NASA LEWIS WIND TUNNEL MODEL SYSTEMS CRITERIA
RONALD H. SOEDER and HENRY C. HALLER Jul. 1994 23 p
(Contract RTOP 505-62-84)
(NASA-TM-106565; E-8742; NAS 1.15:106565) Avail: CASI HC A03/MF A01

This report describes criteria for the design, analysis, quality assurance, and documentation of models or test articles that are to be tested in the aeropropulsion facilities at the NASA Lewis Research Center. The report presents three methods for computing model allowable stresses on the basis of the yield stress or ultimate stress, and it gives quality assurance criteria for models tested in Lewis' aeropropulsion facilities. Both customer-furnished model systems and in-house model systems are discussed. The functions of the facility manager, project engineer, operations engineer, research engineer, and facility electrical engineer are defined. The format for pretest meetings, prerun safety meetings, and the model criteria review are outlined Then, the format for the model systems report (a requirement for each model that is to be tested at NASA Lewis) is described, the engineers that are responsible for developing the model systems report are listed, and the time table for its delivery to the facility manager is given. Author

N94-37755# Loral Systems, Inc., Orlando, FL. Advanced Distributed Simulation Technology Program Office.
ADVANCED DISTRIBUTED SIMULATION TECHNOLOGY ADVANCED ROTARY WING AIRCRAFT. SOFTWARE PROGRAMMER'S MANUAL VISUAL SYSTEM MODULE
ROBERT R. ANSCHUETZ, II 7 Apr. 1994 13 p
(Contract N61339-91-D-0001)
(AD-A280260; ADST/TR/94-003256) Avail: CASI HC A03/MF A01

The purpose of this document is to provide information needed by a programmer to understand the instruction set architecture of the specified host and target computers. The Software Programmer's Manual provides information that may be used to interpret, check out, troubleshoot, or modify existing software on the host and target computers. Section 1 outlines the scope of the document. Section 2 describes the documents referenced in this specification. Section 3 outlines the software programming environment. Section 4 describes the programming information relative to the host and target computers. Section 5 provides general design notes. DTIC

N94-37756# Loral Systems, Inc., Orlando, FL. Advanced Distributed Simulation Technology Program Office.
ADVANCED DISTRIBUTED SIMULATION TECHNOLOGY ADVANCED ROTARY WING AIRCRAFT. SYSTEM/SEGMENT SPECIFICATION. VOLUME 4: SIMULATION SYSTEM MODULE RAH-66 KIT
ROGER BRANSON and ROBERT R. ANSCHUETZ, II 31 Mar. 1994 9 p
(Contract N61339-91-D-0001)
(AD-A280261; ADST/TR/94-003276-VOL-4) Avail: CASI HC A02/MF A01

The ADST ARWA System/Segment Specification establishes the functional requirements for the Advanced Rotary Wing Aircraft (ARWA) Simulator System (SS). Volume 4 describes the requirements for the Simulator System Module (SSM) with respect to the aircraft specific models for the RAH-66 Comanche aircraft. The RAH-66 Kit component provides aircraft simulation for flight dynamics, flight controls, propulsion, navigation/communication, sensors, aircraft survivability equipment, and weapons. DTIC

N94-37768 Department of the Navy, Washington, DC.
INTERFEROMETRIC JFTOT TUBE DEPOSIT MEASURING DEVICE Patent
ROBERT E. MORRIS, inventor (to Navy) and ROBERT WAGNER, inventor (to Navy) 8 Mar. 1994 166 p Filed 30 Jun. 1992 Supersedes AD-D015599
(AD-D016295; US-PATENT-5,293,218; US-PATENT-APPL-SN-906903; US-PATENT-CLASS-356-382) Avail: US Patent and Trademark Office

Jet fuels are tested for thermal stability by passing the fuel over a heated metal tube and measuring the amount of residue deposited as a film on the tube as a result of chemical changes to the fuel. The thickness distribution and volume of a deposited film on a tube are calculated by scanning the length of the tube with an optical probe, shining light onto the tube, measuring the intensity of reflected light of a preselected wavelength from the tube, and correlating the reflected light intensity with positions on the tube. The tube is then partially rotated, and the process is repeated until the entire surface of the tube is scanned. The volumes of each longitudinal slice of the tube are summed to give the total deposit volume on the tube. DTIC

12
ENGINEERING

Includes engineering (general); communications; electronics and electrical engineering; fluid mechanics and heat transfer; instrumentation and photography; lasers and masers; mechanical engineering; quality assurance and reliability; and structural mechanics.

A94-62204
IMPLICIT SCHEMES FOR UNSTEADY EULER EQUATIONS ON TRIANGULAR MESHES
A. S. SENS Office National d'Etudes et de Recherches Aerospatiales, Chatillon (France) and G. D. MORTCHELEWICZ *International Journal for Numerical Methods in Fluids* (ISSN 0271-2091) vol. 18, no. 7 April 15 1994 p. 647-668 refs
(BTN-94-EIX94331337252) Copyright

An implicit finite element method is presented for the solution of steady and unsteady inviscid compressible flows on triangular meshes under transonic conditions. The method involves a first-order time-stepping scheme with a finite element discretization that reduces to central differencing on a rectangular mesh. On a solid wall the slip condition is prescribed and the pressure is obtained from an approximation of the normal momentum equation. With this solver no artificial viscosity is added to ensure the success of the calculation. Numerical examples are given for steady and unsteady cases. Author (EI)

N94-37523# Joint Publications Research Service, Arlington, VA.
JPRS REPORT: SCIENCE AND TECHNOLOGY. CENTRAL EURASIA: ENGINEERING AND EQUIPMENT
26 Oct. 1993 33 p Transl. into ENGLISH from various Russian articles
(JPRS-UEQ-93-007) Avail: CASI HC A03/MF A01

Translated articles cover the following topics: transient gas dynamic processes in ramjet engines; aerodynamic characteristics of delta wings with detached leading edge shock wave at hypersonic flight velocities; effect of atmospheric density gradient on aerodynamic stabilization; measurement of target radar scattering characteristics using frequency synthesized signals; assessing survivability and ensuring safety of large axial-flow compressor blades; procedure for experimentally determining transient aerodynamic forces caused by flat vane cascade; analysis of aerodynamic interaction of

profile and vortex; laser machine for balancing dynamically adjusted gyros; use of heat pumps in solar heat supply systems; numerical simulation of deflagration transition to detonation in homogeneous combustible fuel mixture; and investigation of chemically nonequilibrium flow about bodies allowing for vibrational relaxation.
CASI

N94-37524# Joint Publications Research Service, Arlington, VA.
JPRS REPORT: SCIENCE AND TECHNOLOGY. CENTRAL EURASIA: ENGINEERING AND EQUIPMENT
18 Nov. 1993 28 p Transl. into ENGLISH from various Russian articles
(JPRS-UEQ-93-008) Avail: CASI HC A03/MF A01

Translated articles cover the following topics: measurement of gravitation interaction parameters on satellite; gravitational constant measurement during particle motion in neighborhood of libration points; simulation of dynamics of a high-velocity spinning flexible flying vehicle; anomaly estimation accuracy of inertial navigation system; observability in probe navigation problem; interaction of gyro system oscillation frequencies; imperfect shell dynamics and oscillation control; and variational principle of creep theory for prestressed body analysis.
CASI

N94-37538# Joint Publications Research Service, Arlington, VA.
JPRS REPORT: SCIENCE AND TECHNOLOGY. CENTRAL EURASIA: ENGINEERING AND EQUIPMENT
15 Jul. 1993 47 p Transl. into ENGLISH from various Russian articles
(JPRS-UEQ-93-005) Avail: CASI HC A03/MF A01

Translated articles cover the following topics: formulation of programmed aircraft motion control; floated-type linear acceleration integrated gyro with electromagnetic sensor suspension; ensuring unity of monitoring facilities and methods during life cycle stage of aviation engineering products; methods for forming rational requirements for monitoring fullness of functional systems and aircraft as whole; electron gun with ribbon beam; investigation of effect of airfoil vibrations on its edge noise; bending stability of composite cylindrical shell with longitudinal stiffening ribs; numerical investigation of conical shell flutter; intermediate asymptotics in nonlinear shell dynamics; dynamic stability critical load estimate of shells with holes; heat exchange on tip fins in hypersonic flow; boundary layer laminarization of vibrating wing; nonplanar airfoils with minimum induced drag; supersonic flow about cone under heat influx in vicinity of vertex; aero- and thermo-dynamics of high-altitude flight; discharge characteristics of converging-diverging nozzles with cylindrical minimal cross section path; experimental investigation of supersonic flow over wedges with longitudinal slots on windward side; on limit of motion of systems with dry friction; asymptotic integration of dynamic equations of elasticity theory in case of thin shells; dynamic electroelasticity problem for inhomogeneous cylinder; solution of linear and nonlinear boundary problems of shell and plate theory based on lines method; nonlinear elastic state near elliptic hole in orthotropic spherical shell; acoustic shock wave interaction with cylindrical piezoelectric ceramic shell located near planar boundary; analysis of straining characteristics of glass-reinforced plastic parabolic shells; experimental investigation into strained state of ribbed cylindrical shell under pulse loading; effect of elastic wave inertia during cylindrical shell rotation; clean room technology devices and systems; on effect of normal vibrations on tractive-gripping properties of walking machines; and electromechanical effect of high-current discharges on shell structures.
CASI

N94-37541*# National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.
ACTIVE COOLING FROM THE SIXTIES TO NASP
H. NEALE KELLY (Analytical Services and Materials, Inc., Hampton, VA.) and MAX L. BLOSSER Jul. 1994 61 p Presented at Current Technology for Thermal Protection Systems Workshop, Hampton, VA, 11-12 Feb. 1992
(Contract RTOP 505-70-63-01)
(NASA-TM-109079; NAS 1.15:109079) Avail: CASI HC A04/MF A01

Vehicles, such as the X-15 or the National Aerospace Plane (NASP), traveling at hypersonic speeds through the earth's atmosphere experience aerodynamic heating. The heating can be severe enough that a thermal protection system is required to limit the temperature of the vehicle structure. Although several categories of thermal protection systems are mentioned briefly, the majority of the present paper describes convectively cooled structures for large areas. Convective cooling is a method of limiting structural temperatures by circulating a coolant through the vehicle structure. Efforts to develop convectively cooled structures during the past 30 years, from early engine structures which were intended to be tested on the X-15 to structural panels fabricated and tested under the NASP program, are described. Many of the lessons learned from these research efforts are presented.
Author

N94-37797*# Cincinnati Univ., OH. Dept. of Aerospace Engineering and Engineering Mechanics.
DESIGN OF SCALED DOWN STRUCTURAL MODELS
GEORGE J. SIMITSES *In* NASA. Langley Research Center, Workshop on Scaling Effects in Composite Materials and Structures p 3-18 Jul. 1994
(Contract NAG1-1280)
Avail: CASI HC A03/MF A03

In the aircraft industry, full scale and large component testing is a very necessary, time consuming, and expensive process. It is essential to find ways by which this process can be minimized without loss of reliability. One possible alternative is the use of scaled down models in testing and use of the model test results in order to predict the behavior of the larger system, referred to herein as prototype. This viewgraph presentation provides justifications and motivation for the research study, and it describes the necessary conditions (similarity conditions) for two structural systems to be structurally similar with similar behavioral response. Similarity conditions provide the relationship between a scaled down model and its prototype. Thus, scaled down models can be used to predict the behavior of the prototype by extrapolating their experimental data. Since satisfying all similarity conditions simultaneously is in most cases impractical, distorted models with partial similarity can be employed. Establishment of similarity conditions, based on the direct use of the governing equations, is discussed and their use in the design of models is presented. Examples include the use of models for the analysis of cylindrical bending of orthotropic laminated beam plates, of buckling of symmetric laminated rectangular plates subjected to uniform uniaxial compression and shear, applied individually, and of vibrational response of the same rectangular plates. Extensions and future tasks are also described.
Author (revised)

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GEOSCIENCES

Includes geosciences (general); earth resources; energy production and conversion; environment pollution; geophysics; meteorology and climatology; and oceanography.

N94-37607*# Boeing Commercial Airplane Co., Seattle, WA.
STRATOSPHERIC EMISSIONS EFFECTS DATABASE DEVELOPMENT
STEVEN L. BAUGHCUM, STEPHEN C. HENDERSON, PETER S. HERTEL, DEBRA R. MAGGIORA, and CARLOS A. ONCINA Jul. 1994 165 p
(Contract NAS1-19360; RTOP 537-01-22-01)
(NASA-CR-4592; NAS 1.26:4592) Avail: CASI HC A08/MF A02

This report describes the development of a stratospheric emissions effects database (SEED) of aircraft fuel burn and emissions from projected Year 2015 subsonic aircraft fleets and from projected fleets of high-speed civil transports (HSCT's). This report

also describes the development of a similar database of emissions from Year 1990 scheduled commercial passenger airline and air cargo traffic. The objective of this work was to initiate, develop, and maintain an engineering database for use by atmospheric scientists conducting the Atmospheric Effects of Stratospheric Aircraft (AESA) modeling studies. Fuel burn and emissions of nitrogen oxides (NO(x) as NO2), carbon monoxide, and hydrocarbons (as CH4) have been calculated on a 1-degree latitude x 1-degree longitude x 1-kilometer altitude grid and delivered to NASA as electronic files. This report describes the assumptions and methodology for the calculations and summarizes the results of these calculations.
Author (revised)

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MATHEMATICAL AND COMPUTER SCIENCES

Includes mathematical and computer sciences (general); computer operations and hardware; computer programming and software; computer systems; cybernetics; numerical analysis; statistics and probability; systems analysis; and theoretical mathematics.

A94-62183
DYNAMIC ANALYSIS OF OPEN MEMBRANE STRUCTURES INTERACTING WITH AIR
R. SYGULSKI Technical Univ. of Poznan, Poznan (Poland) *International Journal for Numerical Methods in Engineering* (ISSN 0029-5981) vol. 37, no. 11 June 15 1994 p. 1807-1823 refs (BTN-94-EIX94331337180) Copyright

Vibrations of open membrane structures including interaction with air are presented in the paper. Free and forced linear harmonic vibration problems are considered in the analysis. It is assumed that the air is compressible and inviscid. The aerodynamic pressure associated with structure deformations is described by boundary integral equation. The finite element method for the structure and the boundary element method for the air are used. To discretize the surface of the structure, triangular curvilinear 6-node elements are applied. The effects of the air compressibility and the aerodynamic radiation damping are investigated. The considerable decrease of the lowest natural frequencies in consequence of considering the effect of the surrounding air is observed. Numerical examples are given.
Author (EI)

A94-62186
FURTHER ASPECTS OF DYNAMICAL MODELS FOR RIME-ICE AND SNOW ACCRETION ON AN OVERHEAD LINE CONDUCTOR
G. POOTS Univ. of Hull, Hull (England) and P. L. I. SKELTON *International Journal for Numerical Methods in Engineering* (ISSN 0029-5981) vol. 37, no. 11 June 15 1994 p. 1863-1880 refs (BTN-94-EIX94331337183) Copyright

Current three-dimensional, time-dependent mathematical models for (dry) rime-ice and snow accretion on Overhead Line Conductors (OHLC), of finite span and finite torsional stiffness, assume that the airflow past the iced OHLC is given by Attached Potential Flow (APF) and that the effect of aerodynamic moment on the rotation of the OHLC during ice evolution can be neglected. In the present numerical study a CFD code is employed to simulate the turbulent airflow past an iced OHLC and used to validate APF predictions for icing particle impactions, ice evolution and rotation of the OHLC. Comparisons are made for the following: (a) icing particle impaction velocities determined using the CFD code and APF when, for example, the iced surface is fixed at an attitude experiencing lift; (b) the aerodynamic moment, for a chosen ice shape at a range of attitudes, predicted using the CFD code and APF; (c) the aerodynamic moment, for natural ice shapes, given by APF and measured in wind-tunnel tests; (d) the effect of aerodynamic moment, predicted using the CFD code and APF, on ice evolution during a short period of icing. Finally, on employing aerodynamic moments calculated using APF modified values, the sensitivity of the ice-accretion process, across the span of the OHLC, to conductor rotation and various meteorological and physical data for the icing particles is discussed.
Author (EI)

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PHYSICS

Includes physics (general); acoustics; atomic and molecular physics; nuclear and high-energy physics; optics; plasma physics; solid-state physics; and thermodynamics and statistical physics.

N94-37629# Los Alamos National Lab., NM.
THE EFFECTS OF PROTON-BEAM QUALITY ON THE PRODUCTION OF GAMMA RAYS FOR NUCLEAR RESONANCE ABSORPTION IN NITROGEN
R. GRAYBILL, ed. May 1994 13 p
(Contract W-7405-ENG-36)
(DE94-011609; LA-12777-MS) Avail: CASI HC A03/MF A01

The authors describe a method for performing nuclear-resonance absorption with the proton beam from a radio-frequency quadrupole (RFQ) linear accelerator. The objective was to assess the suitability of the pulsed beam from an RFQ to image nitrogen compared to electrostatic accelerators. This choice of accelerator results in trade-offs in performance and complexity, in return for the prospect of higher average current. In spite of a reduced resonance attenuation coefficient in nitrogen, they successfully produced three-dimensional tomographic images of real explosives in luggage the first time the unoptimized system was operated. The results and assessments of the initial laboratory measurements are reported.
DOE

N94-37657*# Christopher Newport Coll., Newport News, VA. Dept. of Physics and Computer Science.
PROSPECTIVE COMMUNICATIONS RESEARCH TO SUPPORT FLY BY LIGHT/POWER BY WIRE Final Report, 18 Jul. - 26 Dec. 1991
DAVID GAME 13 Jul. 1994 18 p
(Contract NAG1-1309)
(NASA-CR-196369; NAS 1.26:196369) Avail: CASI HC A03/MF A01

A NASA Research Grant NAG-1-1309, Distributed Fiber Optic Systems for Commercial Aircraft, was awarded during July 1991. This report primarily constitutes a summary of findings of the original background research done at that time. NASA is embarking on a research project to design the next generation of commercial aircraft, fly by light/power by wire. The objectives of this effort are to improve commercial aircraft design by (1) reducing the weight of the aircraft to improve efficiency and (2) improving the fault tolerance and safety of the aircraft by enhancing current systems with new technologies or introducing new systems into the aircraft.
Derived from text

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SPACE SCIENCES

Includes space sciences (general); astronomy; astrophysics; lunar and planetary exploration; solar physics; and space radiation.

A94-62291
THE TWO-BODY PROBLEM WITH DRAG AND RADIATION PRESSURE
A. G. MAVRAGANIS National Technical Univ. of Athens, Athens, Greece and D. G. MICHALAKIS National Technical Univ. of Athens, Athens, Greece *Celestial Mechanics and Dynamical*

Astronomy (ISSN 0923-2958) vol. 58, no. 4 April 1994 p. 393-403 (HTN-94-00330) Copyright

The Kepler problem including radiation pressure and drag is treated. The equation of the orbit is derived and the scalar and vector integrals of motion are obtained by direct operation on the vector form of the equation of motion. Author (Hemer)

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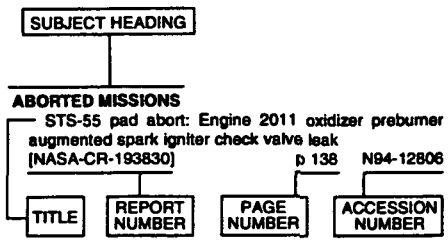

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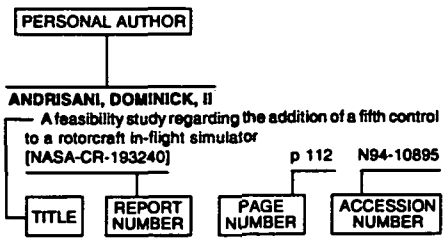

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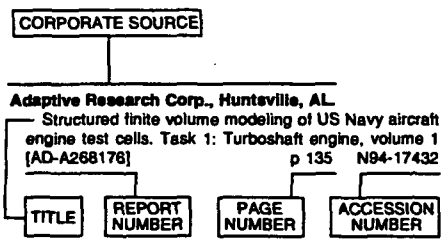

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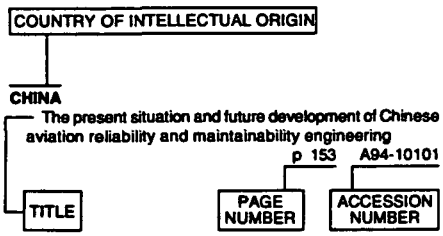

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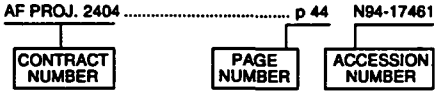

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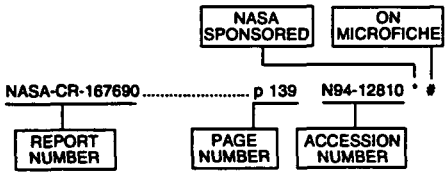

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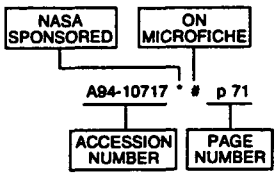

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